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Endodontic and periodontal management of a severely affected maxillary lateral incisor having combined mucosal fenestration and palatogingival groove

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Abstract

Mucosal fenestrations, wherein the tooth root apices are clinically discernible in the oral cavity subsequent to loss of overlying alveolar bone and mucosa, are rare pathologic entities. Palato gingival grooves-anatomic aberrations are also infrequent occurrences that notoriously predispose to periodontal pathologies of varying extent. Both conditions independently are known to popularly affect maxillary lateral incisors. Coexistent fenestration defect and palato gingival groove in the same tooth is extremely rare and undoubtedly is a perfect combination to precipitate severe endodontic-periodontal consequences. In this report, a 34-year-old patient presented to the dental department with complaint of esthetics in relation to exposed root of right maxillary lateral incisor. On closer inspection, a palato gingival groove in addition to fenestration defect was evident on the root surface along with a periodontal pocket of >5 mm. An interdisciplinary treatment was instituted which included endodontic treatment followed by root end resection, osseous bone graft placement and guided tissue regeneration procedures for repair of mucosal fenestration defect. Debridement of the palatal pocket, with saucerization of the groove and restoration with glass ionomer cement were simultaneously employed to correct the palatal defect.

Keywords: Debridement, defect, fenestration, groove, guided tissue regeneration, incisor, mineral trioxide aggregate, pocket

INTRODUCTION

Aclose interrelationship has always known to exist between teeth and their adjacent alveolar processes. Bone surrounding teeth, at times, may undergo alterations with respect to morphology either due to anatomical variations or during periodontal diseases resulting in osseous defects such as fenestrations and

dehiscences. Mucosal fenestration is a rare clinical pathologic entity where in the affected root portion of the tooth is exposed in the oral cavity owing to combined perforation of the overlying bone and mucosa.[1] It is less prevalent that bony fenestration and is commonly seen to affect maxillary and mandibular incisors.[2] Mucosal fenestration is usually devoid of symptoms and not easily recognized by patients unless associated with problems like calculus deposits, hypersensitivity, pulpal involvement and esthetics. The patient most often reports only with the complaint of esthetics.

Palato gingival or radicular groove is another developmental aberration known to maximally affect the palatal surfaces of maxillary lateral incisors but is often missed during a routine clinical examination. It is a malformation which presents as a groove/channel that begins in the central fossa, crosses the cingulum of the tooth and extends apically to or beyond the cemento enamel junction at varying distances and directions along the root surface.[3] Its unfavorable shape and location serves as a perfect bacterial harbor predisposing to pocket formation, concomitant bone loss and pulpal involvement thereby encouraging development of endodontic-periodontal lesions. Depending on severity, the groove may render a direct communication between the periodontium and pulp cavity promoting effortless bacterial invasion.

Endodontic pathology progressing to involve periodontal tissues or vice versa is not very frequent, but when present can lead to complex situations, necessitating stringent interdisciplinary measures for correction. The following report describes the management of a rarely encountered maxillary lateral incisor that presented with failed previous endodontic treatment, and was affected by mucosal fenestration defect at the root apex coexistent with deep periodontal pocket coursing along a palato gingival groove on its palatal aspect. The tooth was severely compromised owing to long standing periodontal inflammation resulting in widespread periodontal destruction. This case report highlights the importance of establishing an accurate diagnosis and proper institution of multidisciplinary comprehensive treatment protocol for salvaging teeth with complex endodontic-periodontal problems.

CASE REPORT

A 34-year-old female patient reported to the department of Periodontics with exposed root in relation to maxillary right lateral incisor. The patient's general medical condition (American Society of Anesthesiologists 1) was good. History revealed previous endodontic treatment in tooth no. 12 performed by a private practitioner 2 years back. On intra oral clinical examination, crown of tooth no. 12 showed distinct discoloration. Apical portion of the root was seen perforating the buccal cortical plate and overlying mucosa with the fenestration defect measuring approximately 4 mm × 3 mm [Figure 1a]. The patient was unable to recollect the period of its occurrence but confirmed the presence of exposed root since 1-year. The patient had also not sought any dental treatment for the past 1-year despite being aware of the existing defect. Plaque and calculus were seen deposited on the exposed root but no pus discharge was evident in the area [Figure 1a]. Probing depth in the gingival sulcus above the fenestration defect was within normal limits. Palatal examination revealed presence of a palatal groove possibly extending onto the root and an isolated periodontal pocket of >5mm [Figure 1b and c]. The tooth presented with grade I mobility.

Radiographic examination of the concerned tooth revealed faulty root canal treatment in right maxillary lateral incisor and a lateral radiolucency on the mid mesial aspect of its root [Figure 2a]. A thin parapulpal radiolucent line was observed on the radiograph which confirmed the presence of a palato gingival groove. It was decided to repeat endodontic treatment in the affected tooth, treat the palato gingival groove and perform periodontal surgical correction of the fenestration defect by raising a full thickness flap.

Treatment

The exposed root tip of right maxillary lateral incisor was cleared of the deposited plaque and calculus [Figure 1d]. Endodontic treatment was reinitiated in the tooth. Previous gutta percha filling was removed from the canal with the help of a hand file and working length established. The canal was thoroughly

cleaned and shaped using step back technique with 15–80 stainless steel K files (Dentsply Maillefer, Ballaigues, Switzerland) under copious irrigation with 2.5% sodium hypochlorite. Apical preparation was done until master apical file (MAF) size 40. The canal was medicated with calcium hydroxide paste and the access cavity sealed for 1-week with a temporary restoration (Cavit, Premier Dental Co., Philadelphia, PA, USA). On subsequent visit, the paste was flushed out of the canal using thorough irrigation with sterile water and dried. Need for odontoplasty with respect to palato gingival groove was anticipated hence mineral trioxide aggregate (MTA) (ProRoot MTA; Dentsply Tulsa Dental, Tulsa, OK) was used to fill the entire canal. Wet MTA was carried into the canal using amalgam carrier, advanced apically to the working length with a K file, 1 size smaller than the MAF, and condensed properly using finger pluggers. Incremental placement and compaction of MTA was continued from apical to coronal area using subsequently larger hand files and pluggers until the level of cemento enamel junction. A moist cotton pellet was placed on MTA and the cavity sealed with intermediate restorative material. Retrograde filling was also done at the apex by direct access using MTA. On third visit after 1-week, the cotton pellet was removed. Flowable compomer (Filtek Flow 3M/ESPE, St. Paul, MN, USA) was placed over exposed MTA and the access cavity permanently restored with bonded resin restoration [Figure 2b].

On fourth visit, the patient was prepared for periodontal surgery. 2% lignocaine anesthetic with 1:1,00,000 adrenaline was given to anesthetize the maxillary anterior region. Palatally, a full thickness flap was raised using sulcular incision and the pocket curetted with Gracey Curettes number 1, 2 and 5, 6 (Hu-Friedy Manufacturing Co., Chicago, USA). The palatogingival groove was saucerized and blended with the root surface using a fine diamond. The coronal extension of the groove was chemically conditioned using 10% polyacrylic acid and restored with type I glass ionomer cement (GIC) (Fuji 1, GC Corporation, Tokyo, Japan).

Facially, a full thickness mucoperiosteal flap was reflected. On raising the flap, it was observed that the entire labial surface of the root was denuded of bone. The mesial, distal and intercrestal bone were intact, but a bone defect was seen circumscribing the root apex [Figure 3a]. The root tip was minimally resected and smoothened with a high speed diamond. The area around root tip was thoroughly curetted to remove all pathologic granulation tissue. Postpreparation of the recipient site with 17% ethylenediaminetetraacetic acid (Pulpdent Co., Watertown, MA, USA); porous biphasic bone graft material containing hydroxyapatite and β tricalcium phosphate (OssiFi, Equinox) to aid in bone regeneration was packed into the defect and over the denuded root surface [Figure 3b]. A bio resorbable collagen barrier membrane (Healiguide®, Advanced Biotech Products (P) Ltd., India) was placed over the bone graft and the flap repositioned and sutured to the adjacent tissue using interrupted sutures with 3-0 black silk [Figure 3c and d]. The pre existent defect in the soft tissue was additionally sutured.

Periodontal pack was placed over surgical site for protection and the patient prescribed a course of antibiotics and antiinflammatory medications. He was advised to rinse with 0.2% chlorhexidine twice in a day for 4 weeks and discharged after giving proper postsurgical instructions. Patient was recalled after 2 weeks for suture removal and evaluation. The pocket depth had resolved. Complete closure of mucosal defect could be appreciated at follow-up appointment of 1-month [Figure 4a and b]. At 6 months, the patient continued to be comfortable without any complaint. Radiographic examination revealed a sound periapex and resolution of lateral radiolucency [Figure 4c]. All probing depths around the tooth continued to exist within normal limits and the tooth was no longer mobile.

DISCUSSION

Fenestrations and dehiscences are not very frequently observed defects of the alveolar bone, but when present can create great difficulties for both the clinician and the patient. Alveolar fenestrations usually exist undetected in the oral cavity until accompanied by the loss of overlying mucosa. Combined loss of bone and soft tissue results in denuded and clinically exposed root surfaces. Their existence can jeopardize

several common dental procedures like endodontic treatment, periodontal or peri radicular surgeries as well as implant placement. Recognition of these pathologies prior to any procedure, is therefore, important to prevent any intra or postoperative complications and improve overall prognosis.

Several etiologies speculated in the development of alveolar fenestrations include (1) anatomic factors like extreme labial prominences of root tips, tooth malpositions, thin or nonexistent buccal cortical plates and (2) pathologic factors like trauma, heavy occlusal forces, orthodontic movement or chronic peri apical inflammation.[4] Once alveolar deficiency has occurred, loss of overlying soft tissue may be seen in areas of thin keratinized gingiva on exposure to mechanical injury or extension of underlying pathology. Contributing factors in the development of fenestration/dehiscence in this case seemed to be multifactorial most likely being periodontal inflammation associated with palato gingival groove, chronic peri radicular pathology, previous endodontic treatment, thin cortical plate and labial prominence of the root. Exposure of the root was followed by plaque and calculus deposition, which further prevented mucosal approximation.

To generate an environment that would promote periapical healing and repair of hard and soft tissue defects with respect to fenestration, it was critical to first treat the tooth endodontically, followed by root resection and peri apical curettage. Endodontic treatment aimed at eliminating all bacteria and toxins from the root canal system prior to surgical correction. The entire canal was then obturated using MTA to thoroughly seal all canal walls and any channels existing as a communication between the canal and radicular groove. MTA was chosen here as it is known to possess antibacterial and osteogenic properties. It creates a potentially impervious seal that is difficult for the microorganisms to penetrate. This unique sealing property, combined with high alkaline pH of 12.5 after curing provides a suitable mechanism for bacterial neutralization and inhibition within the canal system.[5] Also, diffusion of calcium ions from MTA through the dentinal tubules inhibits bacterial colonization and survival at the root surface, which when coupled with osteogenic activity is known to promote new cementum deposition and regenerate periodontal ligament.[6]

Root resection was done to aid containment of root within its alveolar housing and at the same time improve accessibility and visibility around the apex for curettage. Bone grafting with guided tissue regeneration (GTR) on the facial aspect of the root was performed with the aim of regenerating the lost attachment apparatus and provide root coverage. Use of resorbable collagen membrane in GTR membrane therapy has proved to be highly successful when treating endodontic-periodontal lesions in communication and has shown good results relating to bone growth and connective tissue attachment.[7] Porous hydroxyapatite employed as bone graft in this case, has earlier in the literature, known to serve as a suitable bone graft material owing to its excellent bone conductive properties. When combined with high porosity, it permits migration of osteogenic cells from existing bone surfaces into adjacent bone thereby providing useful potential in treatment of periodontal defects.[8]

Palatogingival groove, one of the several morphological variations, serves as an easy pathway for bacterial penetration leading to periodontal inflammation, epithelial attachment breakdown and progression into periodontal pocket.[9] Advancement of bacteria into pulp is likely to precipitate concurrent endodontic-periodontal lesions. Palatogingival groove is often poorly recognized owing to its entrance concealed under the gingival tissue or plaque. A thorough examination to uncover such defects is highly recommended before devising any treatment plan. On careful exploration, a palate gingival groove may be felt as a notch which may or may not be associated with an isolated pocket. Further, its presence can be ascertained on radiographs, commonly seen as dark lines extending along the length of the root, parallel to or superimposed over the root canal termed as “parapulpal lines.”[10]

Prognosis and treatment of palato gingival grooves is greatly dictated by the depth, direction and extent of grooves. Shallow grooves can often be treated successfully while deep grooves have a poorer prognosis. Closed debridement coupled with odontoplasty is usually successful for shallow defects that do not extend down for considerable distances along the length of the root whereas open flap debridement is recommended for more deeper and tortuous grooves.[3] Simple saucerization has shown to be helpful in

eliminating shallow grooves with great success.[11] Here, in this case, the groove was classed as moderate hence simple root planning and curettage of the pocket with radiculoplasty in the cervical part of the groove followed by restoration with GIC was able to provide an effective seal at the radicular entrance.

True combined endodontic-periodontal pathology mostly necessitates institution of restorative, endodontic and periodontal therapies in combination to achieve the best treatment outcomes. Collective treatment rendered in this case which included endodontic therapy, apical root coverage and coronal closure of the groove prevented bacterial colonization and penetration in both retrograde and orthograde directions thereby providing an environment favorable for healing and repair. Attachment of periodontal ligament with repair of mucosal fenestration and periapical healing could be appreciated both clinically and radiographically.

CONCLUSION

Combined endodontic-periodontal problems offer great challenges to a clinician with respect to diagnosis and treatment. These complex lesions usually have a hopeless prognosis, especially when periodontal pathology is chronic in nature and associated with extensive loss of attachment. In the present case report, thorough knowledge and identification of disease etiology followed by institution of comprehensive interdisciplinary treatment protocol were able to render satisfactory results and restore healthy state in a tooth affected with coexistent palatogingival groove and mucosal fenestration defects.

Footnotes

Source of Support: Nil

Conflict of Interest: None declared.

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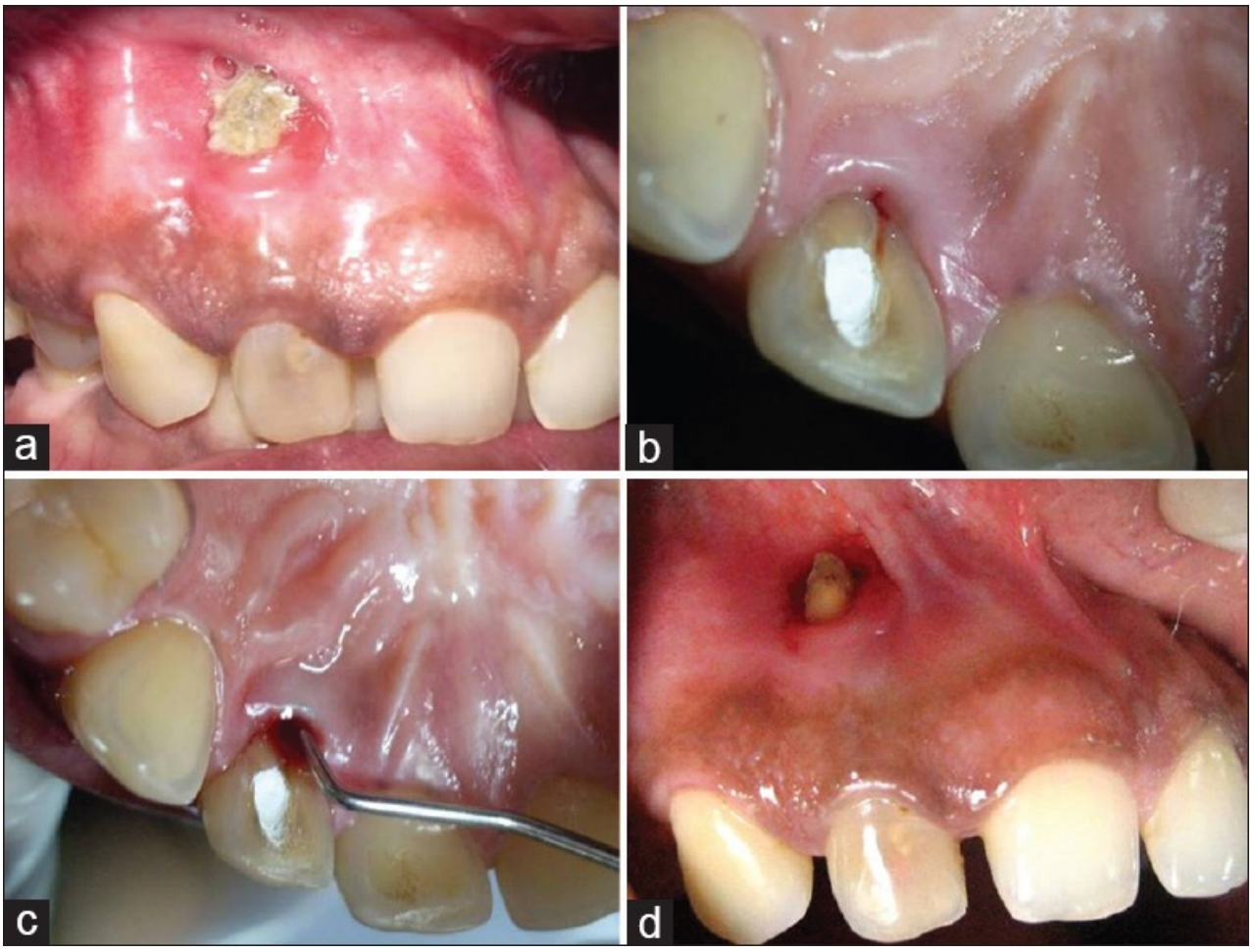
Figures and Tables

Figure 1

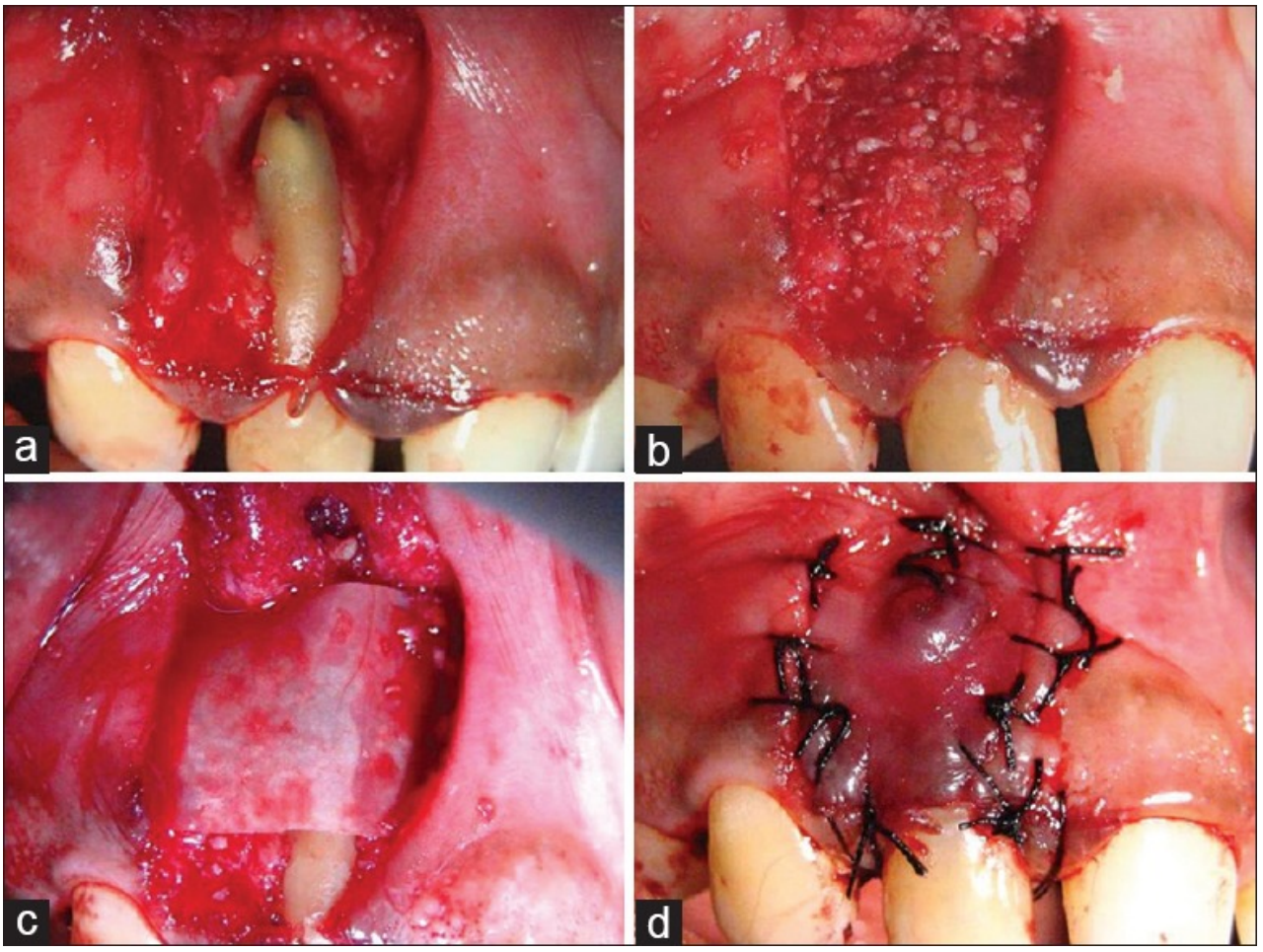


(a) Preoperative defect in maxillary right lateral incisor showing exposed root tip covered with plaque and calculus. (b) palato gingival radicular groove seen extending beyond the cemento enamel junction in relation to maxillary right lateral incisor. (c) periodontal pocket depth of greater than 5 mm present adjacent to the groove. (d) root tip seen after removal of plaque and calculus

Figure 2

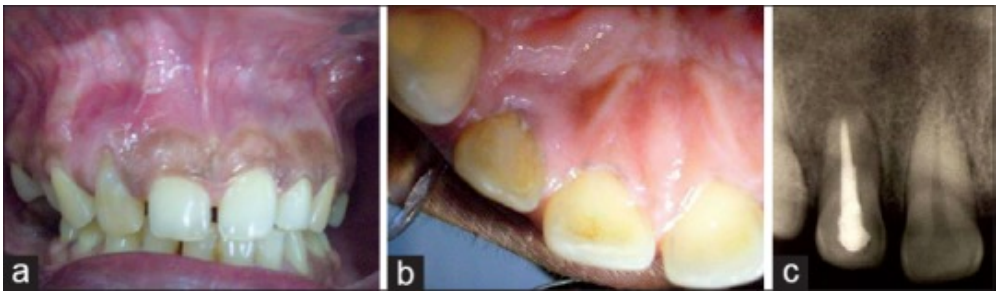
(a) Preoperative radiograph showing incomplete obturation, para pulpal line adjacent to the root canal and radiolucency on mid mesial aspect of the root. (b) Postobturation radiograph showing mineral trioxide aggregate in the entire canal

Figure 3



(a) Osseous defect curetted around the root apex of 12 after resection of root. (b) Bone graft placed in and around the defect. (c) Resorbable collagen membrane placed over bone graft in the defect. (d) Flap sutured after approximation

Figure 4



Postoperative clinical photographs showing satisfactory healing (a) facial view (b) palatal view. (c) 6 months postoperative radiograph showing good peri apex and resolution of lateral radiolucency